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FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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LONDON, SATURDAY, NOVEMBER 13, 1858.

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UNSTAMPED, FIVEPENCE.]

AN ESSAY ON THE VALUE OF THE MINES,

Late of Sir CARBERRY PRICE.

By WILLIAM WALLER, Gent., Steward of the said Mines.

Writ for the private satisfaction of all the partners.

LONDON:

Printed in the year MDCCXCVIII (1698).

THE EPISTLE DEDICATORY TO SIR HUMPHRY MACKWORTH,

Chairman,

now standing in the place of EDWARD PRICE, Esq., and late of Sir CARBERRY PRICE,

AND TO

The Most Noble His Grace the Duke of LEEDS,

The Right Honourable the Marquess of CARMARTHEN,

The Right Honourable PAWLEY, Earl of BULLINGBROOK,

The Right Honourable JAMES, Lord Viscount LANESBOROUGH,

The Right Honourable WILLIAM, Lord DUBOY,

The Honourable Sir HUMPHRY EDWARDS, Knight, Lord Mayor of London,

The Honourable HATTON COMPTON, Esq.,

AND TO

Honoured the Lady ANN CHOLMLEY, Mrs. MARY CHOLMLEY, Mrs. BRIDGET PESHALL,

Mrs. JANE BICKERSTAFFE, Mrs. ANN HILL, Mrs. ELIZABETH LLOYD, widow, Mrs.

ELIZABETH LLOYD, spinster, Mrs. LUCY WRIGHT;

AND TO

Honoured Sir THOMAS MACKWORTH, Bart., Sir JOHN PRICE, Bart., Sir JOHN MORDEN,

Knight, Sir CHARLES BICKERSTAFFE, Knight, Sir CHRISTOPHER WHEN, Knight, Sir PAUL

WITCHCOCK, Knight;

AND TO

Honoured EDWARD PRICE, Esq., HENRY FARMER, WILLIAM POWELL, EDWARD NICHOLS,

BUCKLEY MACKWORTH, PHILIP BICKERSTAFFE, ARTHUR MOORE, HENRY LLOYD,

JON METRICK, JOHN TUGH, JAMES BLAKE, WILLIAM FREEMAN, SAMUEL TROTMAN,

WILLIAM NICHOLAS, JOSEPH SHOOT, RICHARD STEPHENS, GEO. LONDON, HENRY SIMONS,

JENNY GROVE, and JOHN WOODHOUSE, Esqrs.,

AND TO

JOHN OGDEN, THOMAS PHIPPS, senior, PAUL DOMINIQUE, WHITFIELD HAYTER,

ANTHONY FORTY, WILLIAM WOLLEY, THOMAS PHIPPS, junior, RICHARD CHANCY, RICHARD

CURTIS, THOMAS FREDERICK, GABRIEL GLOVER, JOHN GLOVER, THOMAS JEVES,

JOHN TREALE, NATHANIEL THORNTON, JOHN NEWLAND, JOHN PRESTON, EDWARD

PAGE, JOHN HAYWOOD, JAMES HALL, merchants, present partners of the said mines.

Having had the honour to be employed in the management of these mines, of Sir Car-

berry Price, for six years last past, and being much concerned to see so great a treasure

lost and unwrought, merely for want of a stock, and a right constitution for the man-

agement thereof; and finding some of the partners unhappily engaged in differences and

quarrels amongst themselves, and no probability of any reconciliation, or the works

going forward, without the assistance of some public-spirited gentleman, who both un-

derstood the art of mining and also composing of differences; I thought it my duty and

duty to make an enquiry, if possibly I could find out such a person, who would pur-

sue the shares late of Sir Carberry Price, and heartily engage for the public good.

And when all the qualifications are considered that were necessary to be found in one

man, upon this occasion, I presume your honours will be much inclined to believe that

I did not look very easy last.

And when I met with an honest gentleman, I generally found that he was very un-

derstanding in matters of this nature, and either unable, or fearful, to engage in so great an

undertaking; and when I met with a gentleman who had any knowledge of these things,

I perceived that he was for grasping at all, and instead of being willing to

do anything for the public good, was still for getting more for his own particular and

private advantage.

And, upon the whole matter, I found that some had money, but no skill; others

skill, but no money; some, again, had both skill and money (which was very rare),

yet wanted that generous and public spirit that was necessary in this case; and

never found a person who was well disposed in the general, and well qualified in

the respects, yet he either wanted courage to venture so great a sum of money, or judg-

ment to understand the present constitutions of the company and how to amend them

the public good.

But at last, when I was in a manner in despair, and had given over all hopes of suc-

cess, it was my fortune to travel to Neath, in Glamorganshire, where I had the favour

being admitted to see the copper works and coal works of Sir Humphry Mackworth;

having observed his new contrivances in the management thereof, which were more

than I had seen before in any part of this kingdom; and taking notice of his judgment

in matters of law, and also of his frank and generous disposition for the public good; and

that he was by no means of a covetous or grasping temper, but took delight in the ad-

vantage he brought to others, especially the poor miners and labourers, as well as in the

he got for himself.

I presently concluded that he was the fittest person I knew to set the wheels a going

as in Glamorganshire; and I humbly conceive your honours would all be of the same

mind. If it were lawful for me to discover the several improvements I observed at his

works, many of which being yet kept as secrets I must forbear to mention.

But his new method of conveying out the water from his shafts and sinking pits, and

preventing the charges of water-engines, and also recovering a large vein of coal

that means, which was in vain attempted by other artists; and his new sailing

gears, for the cheap carriage of his coal to the waterside, whereby one horse does the

work of ten at all times; but when any wind is stirring (which is seldom wanting near

the sea), one man and a small sail does the work of twenty (which are public), do suffi-

ciently show what his genius is capable of in matters of that nature.

I believe he is the first gentleman in this part of the world that hath set up sailing

gears on land driven by the wind, not for any curiosity or vain applause, but for real

use, whereby he could not fail of Bishop Wilkins's blessing on his undertakings, in

as he was in a capacity to bestow it.

But I must beg leave not only to mention these things (which, however others may

value, I know he is pleased to esteem but as accidental trifles that fell in his way),

but also to take notice of his prudent methods for reducing all his undertakings to cer-

tainty, free from hazard, his copper men working by the ton, and his colliers by the

sight, at a certain price, which is constantly and punctually paid; whereby, as no fraud

can happen to himself without a combination of all, so good encouragement is given to

workmen to be careful and industrious, for their own interest as well as their masters,

and to mention the convenient situation of his copper work, which is such that his men

run the coal with wheelbarrows into the very furnaces, and bring the ore by water

within a stone's cast of the work; nor his prudence in securing partners who had quan-

tities of good copper ore to be smelted with his own coal, before he began his copper work,

whereby the necessity of raising a great stock, keeping many agents and stewards at

salaries in several counties, and great hazards of bad bargains and bad ore, with

any other inconveniences incident to other undertakings of that kind, were all pre-

vented, and not only a great profit made of the copper, but also a great vent secured for

his own coal, both at home in his own copper work, and also abroad in the West of

England, in exchanging coal for copper ore. In all which, and in many other respects

which will hereafter appear, such management and conduct may very well be admired,

especially in a gentleman that was bred up another way.

But I dare not express the honour and esteem I have for this gentleman, for fear of

being offensive, and therefore I have only hinted at these things at present, for my own

information, that your lordships and all the partners may know the true motives that in-

duced me to labour for this revolution, and to bring in Sir Humphry Mackworth to be so

highly concerned in these works, for the common good of all the partners, as well as my

own, and all the agents employed under them.

It was for this end I first communicated these thoughts to Mr. Price and Mr. Powell,

the country, who knowing these things to be true, and being extremely pleased with

my proposal, ordered me to proceed therein, which accordingly I did, and having now

spent near a year's time about it, and at last happily effected my design, to the satisfac-

tion of all parties.

I humbly hope your honours are, or in a short time will be of opinion, when your term

lengthened, and your constitutions settled to your own content, that I have not mis-

spent my time in your service.

I must confess that nothing ever troubled me so much as the misfortunes I laboured

under on the account of these mines: that I should leave my own habitation, and so

many works in the North, in all of which I had been fortunate even beyond expectation,

and come so far into a strange country to lose my labour, and when I had got mines

under my management of so great a value my hands should be tied up by unhappy dif-

ferences from either making profit to you or myself, and, at last, that it should be recorded

in history to all posterity, that the richest mines of that kind in these three kingdoms,

and perhaps in all the Christian world, lay dead and unprofitable for so many years during

my stewardship; whereas, if these mines had been carried on with a large stock and to

the best advantage, they might by this time have raised the fortunes of all the partners

concerned, and been as famous in foreign countries as most other mines in the world.

When I first viewed these mines, and undertook this employment, I freely offered, for the encouragement of all the partners, to take my salary out of the clear profits, but I always apprehended that I was not to suffer for any other person's default but my own, and on that account I am so far from repenting of my bargain, that allowing one year to put the works in order, and assuring me of good management for the future, I shall be ready, instead of 250*l.* per annum present salary, to take 100*l.* for every 10,000*l.* a year clear profit, which shall accrue from these mines to your treasury, over and above all and all manner of charges and expenses whatsoever.

My Lords,—I have at my leisure hours, and for want of an opportunity of doing your lordships and your partners better service, considered the profits that are usually made of other veins, both at home and abroad, especially in the North of England, where I am best acquainted, and have compared the charges and profits thereof, and of these mines together, and the vast advantages these mines have above any of them, which I did at first for my own private use.

But being now advised that it would be a great satisfaction to your lordships, and all the partners, to have a more large account given of these mines, and that your lordships are desirous to know my reasons for setting the same at such a valuation upon which your lordships, and all the partners, may be capable of being the best judges of the value thereof yourselves, I have, therefore, humbly presumed (though a person otherwise very unworthy to appear in print) to publish this following essay on the value of these mines, for your lordships' particular and private satisfaction.

And lest it may be thought I have writ this for any particular advantage to myself, or to encourage others to any undertaking in which I do not venture my own bottom as well as theirs, I humbly beg leave hereby to offer to your lordships, and all the partners, that I shall be ready at all times to accept of shares for my salary at the highest rate that was ever yet given for them.

Provided always that you agree together to settle a good constitution for the management thereof, and to raise a competent stock proportionable to so great an undertaking, to which I am also willing to lay down my proportion, and stand or fall by my former and present valuation.

For though I am sensible the same may seem very high, and almost incredible to others, who do not know the advantages of these mines, or believe that they are so large as they are described; yet to myself, who have spent so much time, and taken so much pains to consider of it, and take the exact measures of them, I have great reason to believe, taking one thing with another, that I have rather set them below than above the real value.

For, first, the price of raising the ore, in the great vein, is set at fourteen shillings and three pence per ton, in the last valuation, which is much higher than it will really cost when the levels are carried home.

Secondly, the five lesser veins of lead are set very much below the real value, if managed with a large stock.

Thirdly, the Copper veins would employ a much greater number of men with brisk management.

And, fourthly, the profits of the silver, which may probably amount to the value of all the rest, is not computed at all, but only mentioned in general terms.

And as to the largeness of the veins, there are several gentlemen now in town who have been in that country—Dr. Thompson, minister of Friday Church, Mr. Phips, of Clerkenwell-green, Mr. Holle, in the Still-yard, Mr. Duckett, in the Strand, near Exeter Change, and several others.

Who, I suppose, will all own I ever represented those veins they took the trouble to view, which were only the great vein and the Box vein, rather less than greater than they really were; but, at that time, I had not discovered the two Copper veins, nor the richness of the five lesser Lead veins, which now make your honours' interest of double the value it was in the year 1693.

And, therefore, since your honours are now like to have the advantage of my labours, and new discoveries; and since I have been the instrument (under Providence) of bringing in a gentleman to redress your grievances and increase your term, I can never doubt having right done me at your hands, nor the works being carried on to the best advantage.

And, for my part, your honours shall all find that I stand upon an honest bottom, and that the common good of all parties concerned is all that is desired by me.

Your honours' most obedient and most humble servant,

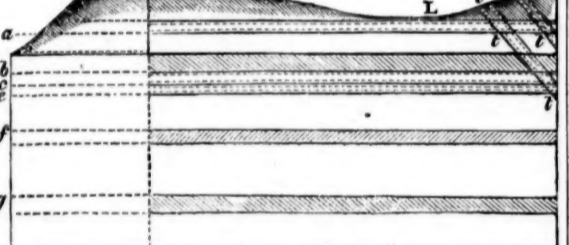
WILLIAM WALLER.

A description of the Silver, Lead, and Copper Mines, late of Sir Carberry

Price, lying in Cardiganshire, within four miles of the navigable River

Dovey, and from thence a mile by water to the port of Aberdovey, where

vessels of 300 or 400 tons may ride with great safety.



- a.—The north vein of lead ore, 3 ft. wide. b.—The great lead vein, 11 ft. wide.
c.—A vein of lead ore, 6 ft. wide. e.—A vein of lead ore, 3 ft. wide.
f.—A vein of green copper ore, 4 ft. wide, and yields 3 tons of copper from 20 tons of ore.
g.—The bog vein, 4 ft. wide, all Potter's ore. h.—The cross vein of lead ore, 3 ft. wide.
i.—The cross vein of brown copper ore, 8 ft. wide, and yields 5 tons of copper out of 20 tons of ore. k.—The first great shaft and western boundary.
l.—The east level. m.—The eastern boundary.
t, t, t.—The places where the cross veins meet with the other veins, which are called by miners the (T) of the veins, and are accounted the richest part of them.
o.—The west level.

NOTE.—All the said veins are fixed and settled betwixt firm and solid sides, and rise equally near to the surface of the ground; and all, except the cross veins, lie parallel to the great vein, descending downwards like the mine of Potosi; but, being many in number, and crossing each other, could not be better described together on paper.

The scale for the length 400 yards in an inch, and for the height of the mountain 80 yards in an inch, and for the distance between the veins 40 yards in an inch.

AN ESSAY ON THE VALUE OF THE MINES,

Late of Sir CARBERRY PRICE.

What great advantages have been made from mines and minerals in all ages is a thing so well known, that it will be altogether unnecessary to enlarge upon it, being generally admitted in all countries abroad, and even at home in this our own nation, where many great families have been raised, or much enriched by them, besides artificers and tradesmen; and where a vast number of poor people live thereby, the very women and children finding employ therein, as well as the men, especially in the mines of Lead.

The ingenious Mr. Carew, in his essay on the State of England, in relation to its trade, its poor, and its taxes, hath this expression—viz., "Nor is this all the product of our earth, whose womb being big with treasure longs to be delivered, and after many throes brings forth Lead, Tin, Copper, Calamy, Coal, Culm, Iron, Alum, Coppers, and sundry other minerals, which return us great treasure from foreign markets whither they are exported." And Sir Josiah Child, in his judicious Discourse of Trade, tells us "That our Lead and Tin, which are natives, and by God's blessing inseparably annexed to this kingdom, carry on much of our trade to Turkey, Italy, Spain, and Portugal, besides great quantities that are sold to Holland, to France, and to the Indies, as is well known to all merchants that trade to those parts."

But yet many gentlemen have been much discouraged of late from laying out their money upon mines, by reason of several disappointments that they have met withal, some of which were occasioned by the ignorance of

common workmen mistaking the sprigs of a vein for the main body, which yet an experienced artist can easily distinguish at first sight. Some by the knavery of miners, who have lodged a quantity of ore in a shaft or drift so artificially as might deceive an ordinary spectator. Others, again, have been defeated in their expectations when they have had a good vein, either by paying too high a duty to the lord of the soil, clear of all charges, or else for want of a sufficient stock to carry on their works; for when the proprietor is not able to make a just and punctual compliance in his bargains and payments, and raise a stock of ore before hand, that work must needs stop before it is brought to perfection, and so, like a house unfinished, and without a cover, must necessarily fall together into ruin and confusion; or, at least, the proprietor must comply to such unprofitable and disadvantageous bargains, and submit to so great expenses, for want of convenient levels to carry off and drain the water from the works, as will render his designs fruitless, and the richest treasures of that kind unprofitable. And, therefore, whoever will begin a work of this nature must first consider the necessary charges of making the levels, adits, shafts, smelting-houses, &c., and whether he hath a stock sufficient for all these things, and thereby to lay a right and sure foundation for so great an undertaking; for if he hath not all his money expended will be lost, and in a manner thrown away. But, on the other hand, where such large veins of Lead and Copper ore are actually found fixed and settled betwixt their firm and solid sides (as these are), the lord's duty bought off, and a competent stock first raised to carry on the same with effect, and to the best advantage, there the profit is vastly great, and as certain as any estate in the world. No man living ever finding the bottom of such veins, or failing of great profit, till the works are wrought so very low beneath the levels (which in this case must be in the next age) that the water grows too hard for them.

There are in the North of England many rich mines discovered, but there are none either in England or Wales that can pretend to come near the value of the famous mines of Sir Carberry Price. I have not read or heard of such a mine of Lead in all the world as the great vein, which is 11 feet wide betwixt its firm sides, and 1½ feet already in pure ore, which still increases downwards, and it is not doubted but at last it will come to be 11 feet wide in ore. And I humbly conceive, I may confidently affirm, that no history hath yet given us an instance of so many rich mines, both of Lead and Copper, lying so near together; and really I cannot but think it is a great pity and loss, not only to the owner, and to that county, but even to the whole nation, that so great a treasure should lie dead and unwrought, merely for want of a right understanding thereof. And, therefore, I have undertaken, with all submission to better judgment, to give my opinion of the value of the same; in doing of which, if I seem to any person to exceed beyond the bounds of a moderate valuation, yet since I have wrote nothing but what I firmly believe, and durst venture my own small fortune in the world upon it, I humbly hope the candid reader will not be offended with me for only offering such reasons to his consideration as by long practice and experience in the mining trade hath induced me to be of that opinion, in which I desire to be understood aright; and, therefore, my valuation doth always pre-suppose that the mines are purchased free from any duty to the lord of the soil, and that a stock of 20,000*l.* be raised, whereof some part to be employed for making the levels, adits, shafts, smelting-houses, &c., and raising several stages or stemples, for a number of men to be employed together (at which time the work will be clear of all obstructions from water, and two men, by blasting upwards with gunpowder, will get more ore than six can do now with their working tools), and that the residue thereof be employed in raising a stock of ore before hand; and also that a year's time be allowed for putting the work in order, and even then, though a very considerable profit will be made, yet it is not pretended, under some years more, to bring the works to the highest valuation. And this being premised, I observe—First, that in the year 1693, before the Copper mines were discovered, Sir Carberry Price, having recovered his right from the patentees of royal mines, divided his interest therein into 4000 shares, whereof each share was valued and sold at 17*l.* per share; and for the other moiety he was afterwards offered 40,000*l.* by an eminent merchant in this city, to be immediately paid down, which he refused for this reason—that I had then demonstrated to the said Sir Carberry and his partners that with a sufficient stock he would be able, in a few years, with 600 men, to bring in a clear profit from one of the said veins of 70,500*l.* per annum; as by a paper printed in the year 1693 may appear, and herein set forth, as followeth—viz.:

Six hundred men employed at the great work, when the levels are up, at 8 <i>s.</i> 6 <i>d.</i> per ton, for getting, washing, and making merchantable, as it is now got, every two men must get above a ton by week to make them wages; but at the rate of 1 ton a week the 600 men will raise 300 tons by week, and at fifty weeks 15,000 tons by the year; this charge of getting is.....	£ 6,375 0 0
Carriage to the River Dovey at 5 <i>s.</i> per ton.....	3,750 0 0
12 <i>d.</i> per ton by water and for landing it into the storehouses at the port of Aberdovey.....	750 0 0
15,000 tons of ore will make 10,000 tons of lead; smelting of this when our mills are up, at 10 <i>s.</i> per ton.....	7,500 0 0
Charges.....	£18,375 0 0
10,000 tons of lead, at 9 <i>l.</i> per ton.....	£90,000 0 0
Charge of getting, washing, and smelting.....	18,375 0 0
Sinking shafts, and incident charges.....	1,125 0 0
Clear profits.....	£70,500 0 0

Some gentlemen have condemned me very much for giving in such an account, as believing this was a greater product than can be raised from any mine in the world; but, under favour, this will appear a great mistake on their side, not only from a plain demonstration of the thing, as aforesaid, but from common experience in other mines, both at home and abroad.

As, first in America, the famous mine of Potosi* is a sufficient instance to the contrary, and therefore I have here inserted a map thereof.

A DESCRIPTION OF THE MINE OF POTOSI.—This mine lies in the country of Choras, in a province of Peru, 70 leagues from the sea, within the tropics, in 21 degrees of south latitude, and was discovered in 1546. From this great vein, which is about 6 ft. wide, doth issue out some small sprigs of little account; and yet here they refine 38,500,000 pounds weight of silver yearly, 1 pound weight of their ore yielding 1 ounce of fine silver, at which rate they must raise in ore yearly 256,250 tons before they can answer that account in silver; but, by Gerard Molino's account, they must raise a great deal more. The great vein runs directly north and south, sloping in the hill. They have made a level, which they were 22 years a driving, but, being very crooked and running far underground, they carry up their ore on their backs, each man about 50 lbs. weight, in wallets, on ladders made of neat's hides, three and three in a row, one of the three having a candle tied to his right thumb, to give the rest light.

This work employs above 20,000 miners, and is wrought night and day, above 1000 yards deep (See Acosta in his *Natural History of the Indies*, and *History of the New World*, by N. N.).

And several merchants that have travelled into those parts relate, "That

* Vide the original map in copper, by P. Lee, at the Atlas, in Chesapeake.

this mountain, by reason of the numerous smelting-houses built upon it, doth look at a distance as if it were all on fire; and that these mines have been the occasion of building a very fine town at the bottom of the hill, called the town of Potosi. Thus you see what great things are done at Potosi by the poor Indians; they can raise 256,250 tons of silver ore in a year; and yet in England 'tis thought a fiction and a romance, and by some a mere cheat to draw in persons to speak of raising but 15,000 tons of ore in a year. I could heartily wish, for my country's sake, that these mines were as rich in silver as that. I should never doubt but in a reasonable time to equal them in raising ore from veins exceeding them in breadth and wideness, and in many other respects, provided there were a stock proportionable employed in the working of them; for there that mine is wrought 1000 yards deep, here from the surface of the ground; there they carry up the ore on their backs, in wallets, as aforesaid, here with the help of a windlass, by which two men can wind up more than 20 men can carry on their backs. And, therefore, I hope, in every respect, it will be thought no vanity to affirm that we have as much art and ingenuity in England as any of the workmen in America; and I doubt not but in some years these mines in Cardiganshire will give occasion for erecting as large a town as that at Potosi, which may deservedly be called by the name of Welsh Potosi; and one advantage at least these will have above Potosi—that whereas that mountain is 70 leagues from the sea, here the proprietors and miners, for their encouragement, may have the delightful prospect of seeing the ships sailing into the port of Aberdovey, to bring them ready money for their commodities. But, to come back into our own country, there are several works in the North that come up to this printed proposal, considering the difference between the veins; for the Right Honourable the Earl of Darwenwater hath, or lately had, mines of Lead in Austonmoor, Cumberland, about 30 miles from the sea, and made of his duty, which is a fifth part of the work, 12,000*l.* a year. Another eminent lord in the North, from a small vein of Lead 3 ft. thick, doth, or lately did, clear 17,000*l.* a year. Another noble lord, from a small vein not 2 ft. thick, and 30 miles from the sea, doth, or lately did, clear above 7000*l.* a year betwixt him and his farmers; and several more such veins there are in the North.

Now, if these small veins, whereof some of them are 30 fathoms deep before they come to the ore, and so far from the sea, can make so great a profit clear above all charges, what must those mines yield whereof one vein is so large as aforesaid, and the least as big as any of them in the North, especially when the levels are made in a cheap country, and so near the sea. But the advantage of these works may further appear by an essay on the value of the works in the North, and these compared together as followeth:—

A SMALL ESSAY, BY A MEDIUM OF PRIZES, AS ORE IS GOT IN THE NORTH, AND IN WALES AT ESKIRHIR, COMPARED TOGETHER.

The raising 15,000 bings of ore, at 1*l.* 5*s.* per bing, which is the middle price between 10*s.* and 20*s.* per bing, amounts to £11,250 0 0
[NOTE.—That two bings and one half is one ton of ore, but four bings are allowed to make a ton of lead.]

The duty allowed to the lord is one-seventh share and a half, being a medium betwixt a tenth and a fifth share, but I will admit a seventh, and that amounts to 2142 bings and six-sevenths, but I will admit of one bing more, which makes 2143 bings, which being deducted out of 15,000 bings, there remains 12,857 bings, which, at 4 bings to a ton, will yield 3214½ tons of smelted lead. The charges of smelting thereof, at 1*l.* 5*s.* per ton, amount to 2,410 10 0
The incident charges are accounted one-eighth of the ore, being their shafts are so very deep, and at that rate amount to 3,750 0 0
The middle price for carriage to the water-side, between 20*s.* and 34*s.*, is 27*s.* per ton, which, for the said 3214½ tons of lead, will amount to 4,338 18 0

Charges £21,749 8 0
Let the price for lead, in both essays, be supposed to be 10*l.*, which for 3214½ tons, will amount to 32,140 0 0
Out of which the whole charge aforesaid being deducted, there remains clear profit 10,399 12 0

Now view this account turned to Eskirhir account, and charged accordingly at a middle price, as ore is now raised before the levels are made.

The raising 15,000 bings of ore at 5*s.* 8½*d.* per bing, which is 1*l.* 3*d.* per ton, which is the middle price betwixt 8*s.* 6*d.* and 20*s.* per ton, doth amount to £4,281 5 0
This ore will yield 3750 tons, being 536 tons more than in the former essay, by reason here is no duty paid out to the lord. The charge thereof for smelting, at 1*l.* 5*s.* per ton 2,812 10 0
Sinking shafts, &c., being it lies so near the surface, is one-fourth of raising the ore 1,070 6 3
The carriage of 3750 tons, by land 6*s.* and by water 1*s.*, in all 6*s.*, to the Port Aberdovey 1,125 0 0
3750 tons of lead, at the supposed price of 10*l.* per ton, amounts to £37,500 0 0

Clear profits £29,335 18 9
NOTE.—That in the first essay of works in the North, it appears by computation that 750 men must be employed for the raising of the said 15,000 bings of ore, allowing 6*s.* per week wages for every workman; now, if the same number of men, and at the same wages, be employed at Eskirhir, they will raise 32,416 bings, by reason the great vein is so much larger, and the ore is raised at so small a price as 5*s.* 8½*d.* per bing, proportionally to the first essay, being four bings to a ton, makes 9854 tons of Lead; but this last essay cannot be fully perfected without showing more at large what difference it makes by employing 750 at Eskirhir.

750 men must raise 39,416 bings to make their usual wages, to every man, of 6*s.* per week, at 5*s.* 8½*d.* per bing. This charge amounts as before to £11,250 0 0
This ore will yield 9854 tons of lead, which, at 10*l.* per ton smelting, is 2,390 10 0
Carriage by land 6*s.*, and by water 1*s.*, in all 6*s.*, to the Port Aberdovey 2,354 4 0
Sinking shafts and incident charges 1,070 6 3

Charges £22,667 0 0
9854 tons of smelted lead, at 10*l.* per ton, is 98,540 0 0
Clear profits £75,872 19 9

So that hereby it plainly appears that the same number of workmen that bring in a profit of 10,399*l.* 10*s.* in the works of the North, being employed on the great vein above described, would bring in a clear profit of 75,872*l.* 19*s.* 9*d.* per annum.

It is further objected by some, that so great a number of men cannot be employed in any one work; and, though all the other parts of the calculation must be allowed to be true, yet it will fail in that particular.

Ans.—That at Arkendale Works, in Yorkshire, which is a small vein, about 2 feet wide, there were 600 men employed at three shifts, 200 men at a shift, every eight hours, and only one man in a breast; whereas this great vein employs six men in a breast on every stage, or steeple, and more stages can be raised there than could be done in the Arkendale Works; and in the works of my Lord Darwenwater were employed above 1000 men. In Cornwall, and some of the Tin works, they employ above 1500 men; and in Germany they employ a greater number, and so in Sweden, Hungary, Poland, &c.; but in the West Indies 10,000, and in some mines above 20,000 men, are employed in a work, as at Potosi aforesaid; and even in these very works in Eskirhir, in ten yards space, at three shifts, every eight hours, were employed 18 men at a shift—54 men in every 24 hours; and, with a reasonable stock, twenty such distances may be made, which will employ, at the same rate, above 1000 men.

But this is a new discovery, and, consequently, cannot succeed in the first adventurers' hands. The truth is, that the profit appears so very considerable, that though there is nothing of any moment to be objected against it, yet the greatness of the thing makes it seem improbable; for, say they, such a thing was never heard of in England, therefore it is impossible it should ever happen. This is the force of the objection; but as there is a reason offered, so let reason be opposed, and then the matter will come to a fair determination; for the very same objection was made against the project of the New River water, where a share was said to be valued at first at no more than 100*l.*, soon after at 500*l.*, and afterwards 36 shares were sold for 151,000*l.* to Simon Middleton, a merchant; and the whole interest of the New River water is valued at this day at 300,000*l.* at the least. The General and Penny Post-office were at first esteemed as mere projects, and slighted in the beginning, and yet came afterwards to be of great value; and these things, though demonstrated at first, were not believed, and no reason could be opposed, but only the greatness of the proposal made them seem improbable.

And though every new trade and voyage the merchant contrives is at first a project, and so, by consequence, the trade to the East Indies, Turkey, Africa, and Hudson's Bay, &c., were mere projects in the original; and though the first beginning of these mines might be said to be a project, in some respect, by reason of the uncertainty, before they had found the veins; yet I cannot now allow that there is anything in this undertaking that so much as looks like a project, since everything is reduced to a certainty beforehand; the veins being long since discovered, fixed, and settled, betwixt their firm and solid sides, many hundred tons of ore got out of them, till the water grew troublesome, and the partners could not agree to raise a sufficient stock for bringing up a level to drain the water from them; but if a man has 1000 acres of the richest meadow ground, and has no stock of cattle himself, nor will buy a stock, or rent the same out to

others that have one, all that rich land must lie dead and unprofitable, and yet without any disparagement to the goodness of the land: so, if a man has the richest mines in the world, even Potosi itself, and yet is not willing himself to raise a competent stock, to make levels, &c., and carry on the works, nor will part with them to others that are, he can expect no profit from them, though ever so rich and profitable in their own nature, and this accident does not lessen the intrinsic value of the mines to men that have both stock and skill to manage them.

And to such it is not doubted but these mines, in a few years, will be worth above a million of money. For, to return, if this great vein will yield so much alone, what will all the other veins yield, which are five in number? besides the two Copper veins, and, taking one with another, more large than any in the North. But if my Lord Darwenwater received 12,000*l.* a year for a fifth part of a work, I hope I may modestly compute every one of the five veins at 12,000*l.* per annum each, for the whole interest thereof (there being no duty to be paid to the lord of the manor), which in the whole is 60,000*l.* per annum more. And so much for the Lead Mines only.

AS TO THE COPPER MINES,

It appears by the map that one is 4 ft. wide and the other 5 ft. wide, betwixt their firm sides, which are very great veins of that kind, and the like scarce known in these parts; and though they are not carried on to any deepness, the one being found at 3 yards and the other at 15 yards deep, and are yet mixed with vein-stone, and so not come to the best ore, which, by the course of such veins, grow much more rich as they take more ground upon them, yet, at present, the one yields 3 tons of Copper out of 20 tons of ore, which is better than one-seventh; the other 5 tons from 20, which is one out of four, as by frequent trials has been experienced; and this sort of ore smelts into malleable Copper, in one furnace, at the first running, inasmuch that the profit of these two veins will be very great, whether sold by the ton or smelted into copper, which may be computed thus:—

A COMPUTATION OF THE VALUE OF THE COPPER MINES.

These two veins will, in a short time, employ at three several shifts, every eight hours, several hundred men; but I will suppose but 100 men in each vein, and the price of getting the ore at 20*s.* per ton, though it may be got for less; when the levels are made, these 200 men, to get their usual wages, must raise 60 tons per week, which, at 30 weeks in the year, is 3000 tons a year, and so the charge for raising the ore is £3,000 0 0

[NOTE.—In Keswick, in Cumberland, were employed 4000 men in one copper mine.—Sir John Pettus, *Fodina Regalis*, p. 32.]
This 3000 tons of ore, at one-fifth and a half, being a medium between a seventh and a fourth (but to give a good allowance, taking one-sixth for the common product), will yield 500 tons of copper, which, at 20*l.* per ton, for smelting and refining, the charges thereof will amount to 10,000 0 0
Carriage of 500 tons of copper to the port, at 6*s.* per ton 150 0 0
Sinking shafts, and other incident charges 750 0 0

The whole charges £13,800 0 0
Five hundred tons of copper, at 100*l.* per ton, amounts to 50,000 0 0

Clear profits £36,100 0 0

Object.—That the most famous copper work in England does not make above 200 or 300 tons of Copper in one year.

Ans.—That in most other works great part of the ores there smelted are sulphury ores, and must be run through six or seven furnaces before they can be refined into good Copper; but if the managers of those works had plenty of such ore as this, WHICH RUNS INTO MALLEABLE COPPER IN ONE FURNACE, they would make 500 tons of Copper more easily than they make 200 tons now.

Object.—That the charges of smelting and refining are too little in this calculation.

Ans.—That for smelting and refining sulphury ores this may be too little, but for this too much, this ore not requiring above one-fifth part of the firing and workmanship incident to the other, for the reasons aforesaid.

Object.—That so vast a product from Copper mines seems altogether improbable; that such a thing was never heard of, and that it is a great matter to make 10,000*l.* per annum of one Copper work.

Ans.—This is an objection, but no reason offered but want of precedent, which may be found in Sweden and Hungary and in many places, and when it is considered that there is such ore to be had in Wales that yields so rich a proportion of metal, and nothing can be said why so much ore may not be raised every year, when the levels are made, which will yield so many tons of Copper at such a price, and when the vast difference between these sorts of ore and the sulphury ores is also considered, and how the price of the latter is raised considerably of late, so that with the charges for the sulphury ore, for great land carriage, for great quantities of coal, for so many smelters' wages to attend such a vast number of furnaces as are used for such ores, with the reparations of the furnaces, &c. It is well if 20*l.* per ton be got clear from that ore; and from this 72*l.* per ton will be got clear by the owner thereof, by reason the charges are so small in all respects, as aforesaid. And so upon the whole matter the same person may better make 36,100*l.* per annum clear of these ores, presupposing them to be his own, as aforesaid, than 10,000*l.* per annum clear of the sulphury ores, and buy both ore and coal, &c.—Thus much in general.

But here is one thing more particularly to be observed, that whereas 6000*l.* or 7000*l.* are laid out in bringing up a level to a single mine, perhaps not so large as the least of these, here one level, that will not cost near that sum, by a cross-drift, will serve for most of those veins, and thereby save a vast sum of money.

Object.—That if these mines were so rich as is pretended, it is not probable the present partners concerned therein would let them lie dead and unwrought.

Ans.—The present partners want a stock, and cannot agree in ways and means of raising it; some are willing but not able, others are able but not willing, though they have frequent general meetings for that purpose; some want money and yet are loth to part with their shares under what they cost them; others have money and will not lay it down for those that have none, unless they can have a great bargain; some again complain that they are not right in their constitutions, and will lay down no money till they are rectified, and whoever pursues the present proposals from the committee to Mr. Price will see where the fault lies, and that neither side labours at this time under the least apprehensions that the mines will not answer their utmost expectations, if they had a sufficient stock to make the levels and carry them on.

Object.—Now, upon the whole matter, the only objection that seems to be left is this, that mines underground are uncertain things, and if they should happen to fail, then all the money laid out upon them will be lost, and though they should yield good ore, yet they may not last out half the term.

Ans.—The terror of a royal mine has long kept a great part of this nation in ignorance, or else this objection would never be made; for in Sweden, Denmark, Germany, Poland, and Hungary, and even amongst the barbarous Indians, where the mining trade is encouraged, it is well known that Nature is regular in her productions underground as well as above, inasmuch as the knowledge of these things has become a science, and many learned volumes in several languages, by Agricola and others, have been written on that subject.

The inhabitants of Cornwall, Derbyshire, Yorkshire, Cumberland, South Wales, and about Newcastle, can tell how certain and regular Nature is in this case; for, although sometimes they meet with difficulties in the first finding of a vein, as when they meet with a small sprig of a vein, which often appears and vanishes again before they come to the main body, yet when once they have found the main vein between their firm sides they never lose such vein without an apparent reason above ground (as by some very deep dingle or valley), especially in Lead or Copper mines, where the veins lie perpendicular or sloping downward; but for horizontal veins, as in coal sometimes, a perpendicular rock will cut its vein in two, and thereupon the vein may rise or fall on the other side, which is commonly called a rise or dip-dike; but ingenious artists seldom fail to recover it again. But in these mines they have been so fully tried from one end of the hill to the other, in several places, that there is no room for that part of the objection in this place.

And as to the other part thereof, it was never known that the bottom of any fixed veins of Lead or Copper, especially such large settled veins, with firm sides, was ever found, or the works left off, till that the same were carried on as deep as the water would permit; and any person that is acquainted with mines can inform us, that it is not possible to work out these veins with so deep a level within the term of 21 years,* especially since the veins still grow richer and wider as they grow deeper; but if it be considered that the mine of Potosi (not above 6 feet wide in any place) has lasted from the year 1546, with 20,000 or 30,000 men at work, that objection must forever cease.

And now upon the whole matter, it is a wonderful thing to consider our English merchants (persons of great worth, judgment, and experience),

what vast sums of money they will venture, view the farthest corners in the world, spread their sails to the uttermost part of the earth for trade, forts, castles, and garrisons, maintaining factories and consuls, building vast ships, and exposing all to the greatest hazard of pirates, tempests, and storms, and yet are easily diverted from venturing a small sum at home in their own nation, to improve a trade from the growth of our own country, though it would yield double the profit, and far less of hazard.

All the rest of the world are striving to engross trade, and yet this at home remains neglected. This trade of Lead and Copper will, in some years, be better known in England, and it is probable, it will hereafter be a wonder to the nation that so vast a treasure should be so long forgotten, and, without doubt, whoever happens to be so fortunate as to look into these things in time, before they grow too common, will have opportunity of great bargains, and of raising vast estates to their families, and of bringing a blessing on their undertaking, by introducing and encouraging such a trade as will employ many thousands of poor people, and shift them from their dens of laziness, and, by hard labour, fit them for the service of their king and country, either in time of war or peace.

This trade would conduce not only to the advantage of particular merchants, tradesmen, and labourers, and to the particular countries where the mines lie, but of the whole kingdom in a national profit, by promoting a foreign trade to Holland, France, Spain, Portugal, Italy, Turkey, the Indies, &c., with the commodities of our own country, without exporting our coin or bullion out of the nation. This would make persons concerned therein merchants as well as miners; and, in short, would make England not only the most delightful, but one of the strongest and wealthiest kingdoms in the whole Christian world.

AN APPENDIX CONCERNING THE SILVER THAT MAY BE EXTRACTED OUT OF THESE MINES.

I presume many persons, especially those that were concerned under the Society of Royal Mines, may much admire that I have not, in my Essay, said one word of the Silver that may be extracted out of these mines, especially since so many trials have been had, in Westminster Hall, about that very point, and such proofs made of the richness of them in silver, by great numbers of witnesses upon oath.

I must confess, some parts of these veins do yield silver, for the great vein lies in ridges or rows, like the planks in a floor, viz.—one ridge of Potter's ore (which is the richest of Lead ore), and another of silver ore, which is poor in Lead, and rich in silver; and I do not deny, but to the owner, that has the ore for nothing, though it is not rich enough to take it from him, since the late Act concerning royal mines, yet it is so rich that a considerable profit may be made out of the same.

But I do not think fit at present to enlarge upon this subject, nor on the method of doing thereof, nor disclose the art of extracting Silver out of Lead, to the best advantage, but shall be ready hereafter to communicate my thoughts thereof as occasion shall require.

However, I presume I may, without prejudice, take notice that Sir John Pettus, in his treatise called "*Fodina Regalis*," p. 10, demonstrates the value of Gogginian, Coomervin, and Darrein ore, that they yield in Silver, per ton of metal, 14 lb., besides the Lead; but if the said ton of metal be made of the ore of Coomsumbloch, it yields 20*l.* per ton in Silver, and, in p. 33, he tells us that "Sir Hugh Middleton undertook the Silver mines in Cardiganshire, paying 400*l.* per annum rent to the Society of Royal Mines; and he cleared monthly the sum of 2000*l.*, and, had he not diverted his gains to the making of the New River from Ware to London, certainly he would have been master of a mass of wealth; but great wit and purses seldom know how to give bounds to their designs, and, by undertaking too many things, fall in all. And we may further give credit to the beneficialness of those mines, when as Mr. Thomas Bushel, by his knowledge and ingenuity to work them to the best advantage, did find business enough there for a Mint, and with the product thereof made provision for the clothing of the late King's whole army."

All persons that know these mines will agree that we can raise more Silver ore from the mines of Sir Carbery Price than ever was raised from all the other mines in Cardiganshire, and with far less charges and expenses; but if Sir Hugh Middleton alone, with a small stock, could make 24,000*l.* per annum, and Mr. Bushel clothe a whole army, what might not the present partners do, if they were united, and would heartily join together, and raise a stock answerable to so noble an undertaking, especially since the art of extracting and refining is much improved of late years, and may be now done with far less expense and waste of Lead? I believe we shall not be opposed by any in case we should affirm that these mines, taking one part with another, are as rich in Silver as some of those above-mentioned; and though at this rate these mines would turn to no account to the patentees of royal mines, since the price of the ore will amount to more money than the clear profits could be made thereof; yet to the proprietors of these mines, and who have bought the same free from any duty to the lord, this advantage in Silver will make a vast addition to the former calculations of the profit of the Lead only.

But I shall forbear to set it down in figures, lest I should either rise too great an expectation on the one side, or frighten the world too much on the other, with the length of numbers; for nothing displeases some persons more than a calculation that sounds so large as this would do, upon a modest computation, though I cannot see any other method to secure in order to fix a right judgment thereof.

For, though some incident charges may possibly happen hereafter, by ill-management that cannot be thought of at present; yet by this way you may demonstrate the true value so near the matter, that if reasonable allowances be made for such contingencies, a man cannot be easily mistaken; but for this I shall not only refer you to what is done in the present age, at Potosi, above-mentioned (and I might instance in many other places), but I will endeavour to open the eyes of those that are strangers to these things, by letting them also see the sense of antiquity on this matter, and that this is no new method.

For Xenophon, an ancient Greek author of undoubted credit (late translated by W. M.), and dedicated to the ingenious author of the essay on "Ways and Means," speaking of the improvement of the revenue of Athens, and more particularly on their silver mines, goes on thus, viz.—

"Our silver mines alone, if rightly managed, besides all the other branches of our revenue, would be an inestimable treasure to the public: but for the benefit of those who are unskilled in enquiries of this nature, I design to premise some general considerations upon the true state and value of our silver mines, that the public, upon a right information, may proceed to the taking such measures and counsels as may improve them to the best advantage."

No one ever pretended, from tradition, or the earliest accounts of time, to determine when these mines first began to be wrought, which is a proof of their antiquity; and yet, as ancient as they are, the heaps of rubbish which have been dug out of them and lie above ground, bear no proportion with the vast quantities which still remain below, nor does there appear any sensible decay, or diminution in our mines; but, as we dig on, we still discover fresh veins of Silver ore in all parts, and when we had most labourers at work in the mines, we found that we had still business for more hands than were employed.

Nor do I find that the adventurers in the mines retrench the number of their workmen, but purchase as many new slaves as they can get; for their gains are greater or less in proportion to the number of hands they employ. And this is the only profession I know of where the undertakers are never envied, be their stock or profits never so extraordinary, because their gains never interfere with those of their fellow-traders.

Every husbandman knows how many yoke of oxen and servants are necessary to cultivate his farm, and if he employs more than he has occasion for, reckons himself so much a loser; but no dealer in the silver mines ever thought he had hands enough to set to work.

For there is the difference between this and all other professions, that whereas in other callings—for instance, braziers and blacksmiths—when their trades are over-stocked, are undone, because the price of their commodities is lowered, of course, by the multitude of sellers. And, likewise, a good year of corn, and a plentiful vintage, for the same reasons, do hurt to the farmers, and force them to quit their employments and set up public-houses, or turn merchants and bankers.

But here the case is quite otherwise, for the more ore is found, and the more silver is wrought and made, the more adventurers come in, and the more hands are employed in our mines.

A master of a family, indeed, when he is well provided with furniture and household goods, buys no more; but no man was ever so over-stocked with Silver as not to desire a farther increase. If there are any who have more than their occasions require, they hoard up the rest with as much pleasure as if they actually made use of it.

And when a nation is in a flourishing condition no one is at a loss how

* At Keswick, in Cumberland, were employed 4000 men in one mine.

† Windeschatl Mine, in Hungary, employs 2000 men. Vide Brown's *Travels*, p. 90.

* Vide Brown's *Travels to the Mines in Hungary*, p. 98.

to employ his money; the men lay it out in fine armour and in magnificent houses and buildings; women lay it out in great equipage, costly habits, and rich clothes.

And, in accidents of war, when our lands lie fallow and unutilized, and in a public dearth and scarcity, what reserve have we left to apply to, or silver to purchase necessities for our subsistence, or hire auxiliaries for our defence?

I have insisted the longer upon these general reflections to encourage adventures of all kinds, to employ as many hands as possible in so advantageous a trade, from these plain considerations, that the mines can never be exhausted, nor can silver ever lose its value.

But to draw this discourse more immediately to the subject of my present consideration, which is the maintenance of our citizens, I will begin to propose those ways and means by which the Silver mines may be improved to the highest benefit and advantage to the public; nor do I set up for the vanity of being admired for an author of new discoveries, for that part of my following discourse which relates to the examples of the present age lies obvious to all the world; as for what is past, it is a matter of fact, and every man might inform himself, that would be at the pains of enquiring.

It is very strange that after so many precedents of private citizens of Athens who have made their fortunes by the mines, the public should never think of following their example; for we who have made inquiry into this matter have heard that Nicias, the son of Niceratus, had employed in the mines, whom he let out to Socias, the Thracian, upon condition to receive an obolus a day, clear of all charges, for every head, and that the same complement of workmen should be always kept on foot.

In like manner, Hipponicus had 600 slaves let out at the same rate, which yielded him a revenue of a mina a day; and Philomides 300, which brought him in half a mina a day; and many others made the same advantage in proportion to the number of slaves they possessed. But what need we to appeal to precedents of an elder date, when, at this day, we have so many instances of the same nature before our eyes?

Twelve hundred slaves, when bought, will probably, in five or six years time, produce a revenue sufficient to purchase as many more as will make the number 6000. This number, at the rate of an obolus a day, a head, clear of all charges, will afford a yearly revenue of 60 talents; and if but 20 of these talents are laid out in the purchase of more slaves, the city may employ the surplus as they may think convenient, and when the number of slaves is increased to 10,000 it will produce a standing revenue to the public of 100 talents a year.

To demonstrate that the mines would take up a greater proportion of slaves to work them I appeal to the authority of all those living witnesses who remember what numbers of workmen were employed in them before the taking of Decelia by the Lacedaemonians, and our silver mines that have been wrought for so many ages with such numbers of hands; and continue still so far from being drained or exhausted that we can discover no visible difference in their present state from the accounts our ancestors have delivered down to us, are undeniable proofs of my assertion. And their present condition is a good argument there never can be more hands at work in the mines than there is employment for; for we dig on still without finding any bottom or end of our mines, or decay of the silver ore.

And companies of private adventurers may carry on the same trade in a quiet-quiet; nor is there any danger that they and the national company will interfere one with another, but, as confederates, are strengthened by their mutual assistance to each other; so the more adventurers of all kinds are employed in the mines, so much larger will the gains and advantage be to all.

And thus you see that these calculations of mine are no new things, but very obvious to the meanest capacity, and commonly practised in all ages and countries; and there can be no reason to doubt but that these Silver mines in Wales might prove as rich as those in Athens or in Hungary, if carried on with a large stock, and would not be exhausted in many ages; and one reason I have (amongst several others) to be of this opinion is this, that all great veins of this nature are in some respect like a great, large spreading oak, and hath a great number of branches, which, like boughs of a tree, shoot out from the body of the vein, inasmuch that when a considerable sum of money is gained out of the same, and many years spent in the working thereof, so that persons would naturally be apt to think that the vein was almost worked out, there is still discovered fresh veins shooting forth from the sides thereof, which are innumerable, and never seem to be exhausted. This was the case at Athens, Hungary, and other places, and would be found the same in Wales, if enquired into. Nature is the same in all places; and though some accidental variations may happen between mines in one country and another, yet they do not vary in substance; and it is by these branches that the great body of the vein is fed, and brought to so large a bulk. You may as well see a large oak without roots and boughs as a large mine without these branches. Small veins have many small twigs, which, being too little to work, are passed by without much notice, as unprofitable and useless; but you will find that many branches of this great vein will be as large as most veins now known in the North of England. In other countries they would know how to value such mines as these, where they have pits or shafts 300 yards deep, as Brown, in his *Travels to the Mine Towns in Hungary*, informs us (p. 98, where he says) that at the mine at Chremnitz he went down by the pit called by the name of the Emperor Rodolphus's shaft, gently descending by the turning about a large wheel, to which the cable is fastened, 15 fathoms deep into the earth; and, after many hours being in the mine, was drawn out again by Leopold's shaft, straight up above 150 fathoms, height surpassing that of the Pyramids by a third part. And yet in these parts we will scarce be invited to lay out our money upon a rich mine, though it appears at the day upon the very surface of the ground.

The fortunate have hours, and those they choose;

The unfortunate have minutes, and those they lose.

I shall conclude with the words of Sir John Pettus, who saith (fol. 5) as follows:—"Besides the enjoyment of the metals and minerals digged from the earth the benefit to the nation is great, for, in the Book of Rates, we shall find above 200 particulars of ingrown metals and minerals, which do afford great customs to the Crown, and would do much more if the management from their original vent were daily inspected;" and in fol. 34 he says that "it might be added, with submissive confidence, that with due care herein we might give law to all Europe, as to all utensils of metals, whether considered domestic or public, civil or martial. And the advantages being so, we may justly infer that by the not duly and carefully managing of this affair the disadvantages are in the same degrees as much prejudicial to the interest of this kingdom as the due use of them would be profitable; for it is clearly demonstrable that every year, for many years past, this kingdom hath, by negligence herein, lost a million of money, which, by vigilance, they might have saved, whereby we want when others abound with our natural store."

CONCLUSION TO ALL THE PARTNERS.

And thus, as I began, so I beg leave to conclude this little treatise under your patronage and protection.

I must confess much more might be said on so fruitful a subject, but you will consider that I was brought up a miner, and not an orator: my business is to demonstrate the truth in as few words as I can, not to put a varnish on it; and to write, not what may be said, but what may be done.

And now, in order to the accomplishment of what I have writ, I have set one thing more to offer to your considerations, and that is of such a nature as I know will be very pleasing and agreeable to you—viz. That the poor may have some small share with you in so rich a treasure, especially the poor miners and labourers; that when they have spent their lives in making you rich, and are grown impotent, and unable to work, either through accident, they may have a comfortable subsistence provided for them.

This will bring a blessing from heaven on your undertakings, and encourage the most skilful miners (and at lower rates) to resort to that work where they shall be provided for in their old age, and against all accidents. And this will tend to no small advantage of all the partners concerned, who will every year save more by cheap bargains than the charity will amount unto; and in this case every miner will have an interest in the works, and will be as careful thereof as if they were his own; your works will never be in want of able miners, or in danger of being lost either by neglect or treachery; you may then be truly called the Friendly Society of Miners, and fear no combination to destroy your works.

It is wonderful to observe how punctual and exact Xenophon was to engage a divine assistance in the like case, whose words are these:—"And the public, upon due consideration, think fit to execute these orders and constitutions, I would advise them to send ambassadors to Delphi and Dodona, to consult the gods, whether such a reformation of our government should not turn to the advantage of the present age, and the benefit of all

posterity. And if these resolutions are ratified by the divine approbation, to consult the oracle once more, to the protection of what gods we should recommend the success of this enterprise, and then to propitiate those gods we are directed to apply to, in order to engage their assistance; and, after this solemn invocation, to enter boldly upon the execution of this design; for it is but reasonable that all undertakings should be attended with more favourable success that are begun, and carried on, under the immediate care and protection of Divine Providence."

Methinks it is a great pity that Xenophon was not a Christian, and as great a shame that there should be so many Christians who have not the devotion of Xenophon.

Who can admire that mines are sometimes unsuccessful, when men presume to dig out the very bowels of the earth, enter into the secrets of the deep, and rifle the choicest cabinet of nature, without so much as consecrating the least part thereof to pious and charitable uses?

And, on the other side, who can doubt success in any thing Sir Humphry Mackworth undertakes? when his designs appear so generous to his partners, so charitable to the poor, and so much conducing to the public good. And it is my hopes and belief that his example and good success in this undertaking will be a means to encourage others to do the like, and to follow such a precedent as may in time extend to make a provision for all the poor of England.

And, therefore, that he may not be diverted from so good a design, but may receive encouragement from you to continue steadfast in his former resolutions, and labour now for the poor, who will hereafter labour for you; and that you may all, not only obtain a temporal but an eternal treasure, that can never be exhausted, is, and always shall be, the prayers of,

Your honours' most obedient and most humble servant to command,

WILLIAM WALLER.

The following reports, having reference to the same mines, are extracted from another rare work, entitled *A Familiar Discourse or Dialogue concerning the Mine Adventure*, dated 1701:—

ABSTRACT OF THE STATE OF THE MINES OF BWLCHYR ESKIRHIR,

From the 31st day of January, 1700, to the 30th day of April, 1701.

By order of the Committee.

The committee have received an account of the mines to the following effect:—

Feb. 3.—That Mr. Waller had set four men to sink 100 yards west of the bog work, where they came at 2 yards deep to a vein of ore, mixed with veinstone, 8 ft. wide; that he is raising ore in the little north vein, but when the levels are up he shall raise more ore in a day than he can do now in a month, and two-thirds cheaper.

Feb. 6.—That in the said new discovery he cannot sink down much deeper for water, till the level is carried home to it, but believes at the depth of the level that it will be a larger vein than that which is called the great vein; that, however, he had let a bargain to Andrew Slack for 100 tons of ore, at 11. 5s. per ton, for raising, stamping, washing, and making the ore merchantable.

Feb. 13.—That observing the said new discovery did improve, he gave Andrew Slack a guinea for his venture, and to discharge his bargain; and afterwards, the same day, set the same bargain of 100 tons to John Pryse and partners, at 14s. per ton, the vein being then gathered into a solid rib of ore, about 1/2 yard wide, and in some places 1 yard wide, a firm ore, besides a rich mixture of ore and veinstone about 5 ft. more, which rib of ore is above twice as large as the great vein was at that depth. This (he says) is a glorious sight, and that but few veins at 60 yards deep can show so much ore as this vein does at 3 yards deep.

Feb. 19.—That the new discovery did mend in sinking downwards. We have it now in the deepest part 4 ft. wide, in firm ore, and we have opened it 10 yards in length.

Feb. 27.—That the new discovery continued 4 ft. wide, in pure ore, and for the most part Potter's ore, besides a rich mixture of ore and veinstone, and that it did undercut in ore into the spar rider, which seemed to be the north side of the vein, so that I have hopes, and not without reason, that the spar rider, at the depthness of our level, may be all ore, for we have cut in one place 1 ft. into the rider, and it is all ore, but this bog water proves a great hindrance to us. We have strings of rich copper ore in Potter's drift.

March 4.—In the new work we are summing in ore, in order to set a pump, till our level is carried home to it. I am dressing up the old shallow level to the great work, in order to raise ore there; and I am carrying up Curtis's drift to the new work.

March 12.—Curtis's drift to the new discovery goes very briskly forward. We continue summing in ore in that work, and driving stops from the sumps each way. We have cut 18 in. into the spar rider, and have not reached the far side of the ore.

March 19.—I hope to clear the great work of water in a short time, and raise ore there. In Curtis's drift we find sparks of ore near 1 cwt. I doubt not but this clay vein will prove a good vein at the depthness of our level. The new work continues to widen as we sink downwards.

NOTE.—These letters also give an account of the progress made in all the levels and cross-drifts, too long to be inserted in this abstract; but this great discovery is confirmed by several hands, that is to say—

Mr. D. Jones to Mr. T. Hawkins, Feb. 20.—I have no more to add but only the good news of a noble sight of ore in the new discovery, which I saw last Saturday.

Mr. S. Pryse to Mr. Shiers, Feb. 20.—There is a very glorious sight of ore in the new discovery.

William Pugh, of Mathewry, in the county of Montgomery, esquire, a person of great worth and reputation, being obliged to come up to London, was pleased to send a skilful artist in mines to view this new discovery, with orders that he should write him such an account thereof as (if occasion were) he would make oath of the truth thereof, whereupon he sent him this following letter:—

To William Pugh Esq.—Sir: I was, according to your order, on Monday last, being the 19th inst., at Bwlchyr Eskirhir, where I had the convenience of taking a full view of the new discovery there, which I found as follows:—The vein is 120 yards west of the bog work; it is opened or bared 10 yards in length; the top of the ore at 3 ft. deep from the surface of the ground, is 1 1/2 yards in a rib of pure ore, somewhat deeper, and in less than 9 ft. sinking it affords a rib of very good ore, 4 ft. wide, and, in a word, increases still as they sink, and the firm sides open kindly. The ore is for the most part firm Potter's ore, 2 in. or thereabouts of small-grained ore being mixed with it, which, when cut with a knife, proves very mellow, and soft as the other. This is a true and just account of the work, which (if occasion required) I will make an affidavit of, who have no interest in misrepresenting things, nor any other design than to do right to the truth, and to satisfy you how the matter really stands.—RICHARD MORRIS.

Though it cannot be doubted that this will give full satisfaction of the truth of this matter, yet at the request of some of the gentlemen, David Jones, now in London, having made the following affidavit, it was not thought fit to omit the same on this occasion:—David Jones, of the parish of Llanbadarn Vawr, in the county of Cardigan, gentleman, maketh oath, that on the 23d day of March last past he this deponent did go to the mines of Bwlchyr Eskirhir, in the county of Cardigan, late of Sir Carbery Price, and now belonging to Sir Humphry Mackworth and partners, and (amongst other things) did there particularly view a new work, or vein of ore, lately discovered in the bog eastward from the great work, and about 120 yards westward from the bog work, and did carefully measure the said vein in the deepest part thereof, and found it to be 3 yards 9 in. deep, or thereabouts, and 4 ft. 3 in. broad in ore; and also that the said vein did give 1 ft. more ore into the spar rider; and further, that the said vein of ore was then opened and bared to the surface of the ground for 10 yards 2 ft. in length, or thereabouts, which was the largest and most glorious sight of ore that this deponent ever saw or heard of so near the surface of the ground; and this deponent further saith that the sample of the ore lately delivered by this deponent to Sir Humphry Mackworth, at his chambers in Lincoln's Inn, was taken up by this deponent out of the ore of the said vein, and that he verily believes that the ore in the said vein will generally hold as good as the same he so delivered to Sir Humphry Mackworth, as aforesaid.—DAVID JONES.

Richard Morris to William Pugh, Esq., March 21.—The new discovery at Bwlchyr Eskirhir widens downwards, and that which was hard ore at the top cuts out to good Potter's ore; they will lengthen their work above double in a short time.

Mr. Waller to the Committee, March 26.—The new discovery continues to widen downwards, and the spar rider undercuts in good ore, so that I continue my hopes that the said ore, which is 3 yards wide, will be all ore for our level, for it is altered strangely in 4 yards driving; it is all white spar at the surface, and at 4 yards deep the sun side of it is very fine ore, near 2 ft. wide in some places. In Curtis's drift the sparks of ore increase from 1 to 2 cwt. of ore Potter's ore; this vein is now above 5 yards wide. I am timbering the shaft to the great work, and shall raise ore there as soon as I have it in order to carry down the ore for more miners.

April 2.—Curtis's vein continues its sparks in large lumps of pure ore, and they increase upon us, so that I expect them in a short time to take a set in a firm rib of ore. This bog will prove a wonderful rich work; the vein is near 6 yards wide, and all thrown with lumps of this fine ore, and this is but 7 yards from the surface, and we are going upon the rise of our sills. Our new discovery still widens downward; we are troubled with water, and cannot raise much ore yet, but when Curtis's drift is carried home to it we shall then double and treble our men in raising ore there. We have not half so much water in the great work as we used to have; we think that the west level hath met with some crack in the rocks that help to drain it. I am timbering yet in the shaft, and expect more miners.

April 9.—Curtis's vein increases in ore; the new work continues to widen downwards, and we have firm ribs of ore in the spar rider. When Curtis's drift is up that will be a rich work indeed. I am now beginning to raise ore in the great work, but have no new men come yet. I will send my man to the North for more men, for I shall have room for a great many in a little time. Mr. John Norman wrote a letter to Col. John Perry, a Member of Parliament, giving an account of the mines, to the same effect as is above mentioned.

Mr. Waller to the Committee, April 16.—The large sparks of ore continue in Curtis's drift downwards, and the level hath met with a crack, and the ore grows more soft. I am raising ore in the great work, but have no new men as yet. In Waller's drift we have some small sparks of ore, so I hope we grow near that vein. The west level is hard; I suppose we are in the side of the clay vein, and when we are in that vein we shall sink briskly forward.

Mr. Simon Pryse to Mr. D. Jones, April 17.—You may acquaint the committee that the work goes on bravely, and the great vein mends upon it. So doth likewise the new vein which was discovered at their going out of the country, and I hope by the time the masters come down they will find all the works in a good method and posture.

Mr. Waller to the Committee in these words following, April 23.—Since mine of the 16th, I began a shaft 8 yards north of the new work, and on the point where the large sparks of ore are got at 7 yards deep. But here at 3 yards deep in this new shaft we struck upon the quick vein, so that the bottom of it is as if it were paved with good Potter's ore, and we have got no side of it, so what width it will reach till I see the sides I cannot inform you; we raised ore of all sizes, from a stone to 2 cwt., and some so large we could not remove till our shaft is timbered; this is what I expected, for in mine of April 2 I told you we were going upon the rise of our sills, so that I doubt not but we shall reach here where it will take its set, for here the ore is gathered into one body, and is 3 yards within 2 yards of the surface.

We are summing and driving in the new work in good firm, mixed, hard and soft ore, and the spar rider continues to undercut in ore. I intend to cross-drift from the new shaft bottom, which will be 8 yards, and will clear the new work of water about 5 yards deep. I told you in mine of April 9 that I had begun to sink at (e) in the west level;

we have got about 7 yards deep, and there we have come to ore, it is not yet in a firm rib, which a little sinking will bring to light.

We raise more Potter's ore out of the great work than formerly. It grows softer the deeper we go, and our west level will come 30 yards under our sills; so that it may be much softer at our levels; however, we can raise it upwards when our levels come to it as fast as we please, or as fast as it can be drawn. The west level is not so hard as it was. We have no other alteration in any part of our works.

As to the raising of ore, I have done what was possible in the winter time, the water being so strong upon us that we were not able to sink down our sumps till the weather grew warmer, that the men may be able to work naked in the water; but as soon as Curtis's drift is driven home, and a sump sunk into the level, and a few stages made, I shall quickly make you amends. I have such a glorious sight before me, that I am in the condition of Tantalus, and am resolved to work night and day till I have raised the works of water. But I hope patience will not be so great a task now your victory is in prospect, as it was before. We have lately raised ore in several places, but till I have raised greater quantities did not think it worth while to dress it up and weigh it; for when the works are in order, and the water conquered, I shall then raise more ore in one day than I can now in one month.

I have all hands fully employed, and want more; and though, to please you, I do now raise ore before the works are in order, yet you will have more profit from what is left than from what is now raised before the levels are up.

Gentlemen, I beg your pardon for this tedious letter, and hope you will believe me, honoured Sirs, your honours' most obedient, humble servant,—WILLIAM WALLER.

Mr. Turner came in with his ship last Saturday night. The smelting and refining at Neath is carried on with all the diligence and care that can be expected; several ships being employed to carry ore to coal and coal to the ore, round the south coast of Wales. And some improvements have been lately made in the art of separating silver from lead; which it is hoped will tend to the great advantage of the nation, as well as of this company.

Sir Humphry Mackworth has ordered a pair of strong flood-gates to be placed at the mouth of the canal lately cut by him from the river of Neath, whereby vessels of 100 tons may come up and discharge at the crane, within 400 yards of the smelting and refining-house; he has also erected a red lead mill, a large court with a high wall, a counting-house, and other conveniences. And we have two ships loading of lead and litharge ready to come from Neath to London, and have received an account that the ship called the *Tichfield*, Henry Gilbert master, is sailed from the port of Neath, bound for London, and freighted with lead and litharge of lead, for the use of the company.

The account is such as needs no explanation, the mines beginning now to speak for themselves, with more proper arguments than can be expressed, which is writing; and the committee having thus discharged their trust by giving a true relation of the works of fact, do leave every adventurer to use his own judgment in the construction of them.

By order of the committee, FREDERICK PIOT, Secretary.

The committee, since the last printed account of the mines, have received several letters from Mr. Waller, and others, to the effect following:—

April 30, 1700.—The new pit which in his last (mentioned in the former abstract) was as if it were paved with ore, continues in good Potter's ore; we have met with the sun side of the vein, but have not yet met with the north side, so that what wideness it will carry I cannot yet tell you. The new work widens as it goes downward, and is carried into a firm rib of ore, and that which was the worst part is now become as good as the rest. We have begun a small drift at the shaft (E) in the west level, to carry off the water, and have small sparks of ore there. We raise some ore in the great work. Benjamin Michael's vessel is arrived with coal from Neath. Turner's vessel is freighted with ore, and will sail with the first fair wind.

May 7.—Our new pit in the head of Curtis's drift goes down in ore. The new work continues good, and the spar rider undercuts with ore. The shaft at E goes down well; the ore there sets to the north. We continue to raise ore out of the great work. Benjamin Michael's vessel will be loaded with ore to-morrow with a cargo of coal.

May 14.—That the new pit is sunk down to the bottom of Curtis's drift. We met with a vein rider 4 ft. wide. The settled rib of ore sets on the sun side; we have a mixture of ore all over, the wideness is yet uncertain. This is like to prove a wonderful vein in the deep and fine Potter's ore. We had it, about 30 yards east of this place, 9 yards wide in ore and veinstone. The excessive wet weather obstructed our men in the new work. I have employed washers to dress up the worst of that ore. The shaft between L and K is now sunk. Since we set on the great work we have cut into the copper vein, and Mr. Waller stuck all night underground to see the event, which had like to have set to the north. We got about 2 ft. cut into it, very rich in ore, and could see no sign of the further side; but we durst cut no further, the same so much water out of it, for fear it should overset our pumps, and drown us out. We have loaded in Benjamin Webster's vessel, called the *Hope of Neath*, 81 tons of good ore, and she will sail the first fair wind.

May 21.—The workmen at Curtis's drift and new work go well on. They affirm they hear the knockers to the sun of them; and we have some reason to believe there is another vein there, having shod ore above, which could not tumble up hill, and therefore must come from some vein thereabouts. The shafts D and E are much troubled with water; and the level hath met with a crack, which, though it is not so great, yet it is a great hindrance to us. We have not yet been able to make any further trial of the copper vein; that vein is above 2 yards wide. We have some sparks of the lead ore mixed with the copper. The *Hope of Neath* sailed last Friday.

May 28.—We continue driving from Curtis's drift to the new work, in which drift we have cut about 1 yard in good ore, and are not yet at the sun side of the vein. At 5 yards high, above the level, we have set on six men, at 20s. per fathom, to drive in ore, and are in hopes that ore will not stand us in 1 noble ton; and as soon as they are driven out 2 fathoms, we will set on six men more to drive in ore under them. It is a glorious fine vein, and widens in sinking as well as in driving. We shall not raise much ore till the level be up to the new shaft at the bottom.

June 4.—We have, in Curtis's drift, crossed through the ore, but the stone on the sun side is a vein rider, so we expect more ore on the other side of it, that vein rider being like to be all ore at the deep. The new work continues very good, but the great work is strongly watered, the water that feeds the copper vein being now let into it. Mr. Turner is returned from Neath with coal, for another loading of ore, and will be freighted this week.

June 11.—In carrying on Curtis's drift to the new work we met with a new rib of copper ore joining to the sun side of the lead ore, about 4 in. wide, but how this will prove is yet uncertain. The east level hath met with a crack, which, though it is 30 yards from the bog-work, yet has let out the water there, and we are in hopes it will dry that work. We have ventured again to cut into the copper vein from the great work, where we find lead as well as copper ore. We are got about 1 yard into it, but we are afraid that water will be too hard for our common pumps; it is like to prove a rich vein. We cut into this copper vein about 4 fathoms from this place, where we found it 2 1/2 yards wide; and there the copper was but small like peas, but here they are in a firm body, but strongly watered, which is the better to be liked if our levels were up. The great work is very good, and the new work begins to lengthen in ore at both ends. Our market on the sun side is very good every Saturday; and we are now with a person to read prayers to the miners. Mr. Turner was loaded again last Saturday with ore, and will sail the first fair wind.

June 18.—The bog-work continues draining through the chink in the east level. I have set men to dress the leads. I shall want more miners for that work. The new work gains in ore on the spar rider; the boring engines will be useful in raising ore hereafter, but not in our present way of working.

June 25.—We are dressing and timbering the bog work; the new work continues rich in ore. We are much oppressed with water in the great work, but we have 18 men employed in raising ore. We are cutting down a rib that was formerly left in stone, which proves a very good hard ore. Mr. Waller in this letter takes notice, that his year for setting the works in order is almost expired, that he expects his salary for that year according to agreement, but that he will stand to his offer for the rest; that though he has met with harder rocks than he expected, which has delayed the levels, yet he has also met with other discoveries which are sufficient to encourage him to stand his ground.

July 2.—The men are raising some ore in the great work and new work, which the deeper we go the more it gains in ore on the spar rider, which promises fair to be all ore at the level. Turner is loaded, but the wind is against him.

July 9.—In the bog-work the sludge and dirt got into the chink, and stopped the water from the bog work to the east level, and we are preparing to raise ore in that work. Several of our men are sick of a fever. Sir Humphry Mackworth has contracted for a place to build a cupola in this county, very convenient for the company, being by the side of the navigable River Dovey.

Aug. 20.—We continue to dress out the bog work; the east and west level go well forward. The shaft (D) wants 15 yds. to the bottom. The new work continues very good.

Aug. 27.—The new work is increased in ore this week 1 foot in breadth; Curtis's drift to it is all faced in firm rich ore, and we hope will continue in ore to the new work, which is 6 or 7 feet more. Mr. Minshall, the goldsmith, is now with us to view it, and to carry the good news to Sir Humphry Mackworth at Mathewry.

Sept. 5.—Mr. Turner is sailed from Neath to London, freighted with lead and litharge, of which an invoice is enclosed.

Sept. 10.—We have struck upon ore in sinking the shaft at (E) in the west level, which leads to us in the sinking, and widens downward. Sir Humphry Mackworth, Mr. Young, and Mr. Player, are set out from the mines, Mr. Young to London, the other to Neath; Mr. Curtis and the engineer are here.

Sept. 11.—Mr. Curtis to the committee:—That the ship, called the *Hope of Neath*, which lately carried lead and litharge from Neath to London, is arrived from London to Dovey, and hath brought several criminals to work at the mines. Mr. Player and he hath seen the new discovery, and that it affords a noble sight of ore.

Sept. 16.—Mr. Player having lately taken a progress to the north and west of England, and viewed all the considerable mines there, and afterwards the mines of this company, wrote a letter:—That he was just come from the mines, where he could not see the great vein, or copper vein, the water from the copper vein having newly drowned it; but at a shaft then sinking on it against the west level came up, the sinkers were come to it again quick in ore at about 10 fathoms deep; and he supposed the engine then going to be set up would in a short time clear the water in the great work, which the miners said in them, at 7 yards deep, thicker than any I saw in the North, or elsewhere, in those mines reckoned the best in England, many of my 60, 80, and 100 yards deep, but I could not discover the full thickness of it, it inclining more than usual to the north side. Curtis's drift is but 4 or 5 yards north of it, and in ore, and below it, which makes me think that may be the north part of the vein; it is about 120 yds. between the new discovery and the bog work, and are both so like each other in ore dimensions, and in the turning and winding, that it must needs be the same vein, and no doubt proves quick between the two places. We want more miners.

Sept. 17.—The ore in the great vein at the shaft at E widens downwards; we shall begin again to raise ore in the bog work this week; we are now fixing the engine in the great work.

Sept. 17.—Mr. Curtis from the mines:—All things here have a good face, and doubt not but the partners will receive an encouraging account from all hands. Sir Thomas Mackworth is now at the mines. I shall return to London by way of Neath.

Oct. 1.—I have received the new apprentice; they were glad to be parted from their